STATE OF IDAHO
DEPARTMENT OF
ENVIRONMENTAL QUALITY

1410 NORTH HILTON, BOISE, ID 83706 · (208) 373-0502

C. L. "BUTCH" OTTER, GOVERNOR
TONI HARDESTY, DIRECTOR

March 26, 2007

Rick McCormick
CH2MHill
Boise Office

RE: Modeling Protocol for the Glanbia Foods Facility Located in Gooding, Idaho

Rick:

DEQ received your dispersion modeling protocol on March 23, 2007. The modeling protocol was submitted on behalf of Glanbia Foods, Inc. The modeling protocol proposes methods and data for use in the ambient impact analyses of a Permit to Construct application for an increase in lactose and whey protein concentrate production at their facility in Gooding, Idaho.

The modeling protocol has been reviewed and DEQ has the following comments:

- Comment 1: The protocol does not discuss how downwash will be assessed. Since the scrubber stack is the controlling source, I would suggest using building parameters for the controlling building for this source. The controlling building is the one that results in the largest GEP stack height. Please provide calculations supporting the selection of the dominant building with the application.

- Comment 2: The application should provide documentation and justification for stack parameters used in the modeling analyses, clearly showing how stack gas temperatures and flow rates were estimated. In most instances, applicants should use typical parameters, not maximum temperatures and flow rates.

DEQ's modeling staff considers the submitted dispersion modeling protocol, with resolution of the additional items noted above, to be approved. It should be noted, however, that the approval of this modeling protocol is not meant to imply approval of a completed dispersion modeling analysis. Please refer to the *State of Idaho Air Quality Modeling Guideline*, which is available on the Internet at http://www.deq.state.id.us/air/permits_forms/permitting/modeling_guideline.pdf, for further guidance.

If you have any further questions or comments, please contact me at (208) 373-0112.

Sincerely,

Kevin Schilling
Stationary Source Air Modeling Coordinator
Idaho Department of Environmental Quality
208 373-0112

Air Dispersion Modeling Protocol for Glanbia Foods, Gooding Facility

(15-dayPermit Construction Approval)

Gooding, Idaho

Glanbia

Submitted to:

Idaho Department of Environmental Quality

March 2007

Prepared By:

CH2MHILL

Brief Project Background

Glanbia Foods, Inc. (Glanbia) is in the process of preparing a 15-day Permit to Construct (PTC) application for an increase in lactose and whey protein concentrate (WPC) production in Gooding, Idaho. The production for lactose and WPC processes were exempted by the Idaho Department of Environmental Quality (IDEQ) from obtaining an air quality Permit-to Construct (PTC) in 1996. Potential emissions are based on the facility operating for 24 hours a day, 7 days a week.

An air quality impact analysis will be performed in support of the pre-permit construction approval per IDAPA 58.01.01.213. Idaho regulation requires the facility applying for a PTC to demonstrate compliance with the National Ambient Air Quality Standards (NAAQS) and with Toxic Air Pollutant (TAP) standards (IDAPA 58.01.01.210).

This air dispersion modeling protocol is being submitted to the IDEQ for approval prior to the initiation of the air quality modeling for the Ganbia facility. This document summarizes the modeling methodology that will be used to evaluate the facility's impacts to air quality with respect to criteria and toxic air pollutants. It has been prepared based on the U.S. Environmental Protection Agency (EPA) *Guidelines on Air Quality Models* (GAQM), and the *State of Idaho Air Quality Modeling Guideline* (ID AQ-01, December 31, 2002).

Sources

Process Description – Lactose

Lactose is sent through an evaporator, concentrator, crystallizer, centrifuge, and then a dryer. The exhaust gas from the dryer is sent through a cyclone where product is recovered and recirculated back to the product stream. The product that is not recovered in the cyclone passes through a scrubber. From the dryer, lactose is transferred to a sifter, mill, classifier and baghouse where the finished product is recovered. The finished product is sent on for packaging. Traces of particulate matter are released to the atmosphere separately through the top of a scrubber and baghouse.

The solids feed rate exiting the lactose dryer is currently estimated at 6,626 pounds per hour (lb/hr). The new solids feed rate is estimated at 7,621 lb/hr, resulting in a net increase of 995 lb/hr of whey product.

Process Description – WPC

Whey protein concentrate is sent through an evaporator where the material is concentrated. This concentrated liquid is either sold as finished product, or is transferred to the dryer for further processing. The exhaust from the dryer is sent through a cyclone and then to a baghouse where fine whey powder is recovered. The recovered material is returned to the main product stream, which is sifted and sent on for packaging. Traces of particulate matter are released to the atmosphere through the top of a baghouse.

The solids feed rate exiting the WPC dryer is currently estimated at 4,300 lb/hr. The new solids feed rate exiting the WPC dryer is estimated at 5,750 lb/hr, resulting in a net increase of 1,450 lb/hr of whey product.

Emission Control Description

The lactose scrubber is considered an emissions control device for particulate matter.

Source Parameters

The EPA approved screening model, SCREEN3, will be used as the preferred model to evaluate the whey production increase.

The modeling analysis proposed will use a combined emission rate for PM_{10} through a single representative stack *(Merged Parameters for Multiple Stacks, pg 2-3, Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, Revised, USEPA, October 1992)*. A copy of the referenced guidance material is included in the attachment.

Each of the stacks are located on the same roof tier within approximately 30-40 feet of one another. Stack parameters and corresponding emission rates from the lactose scrubber, lactose baghouse, and WPC baghouse were utilized to evaluate the lowest value of **M** as a representative stack. The source parameters are summarized in Table 1 along with the lowest value of **M**. A facility layout showing the location of buildings and emissions sources will be included in the final report.

TABLE 3
Stack Parameters

Source ID	Stack Height (m)	Flow (acfm)	Flow (cms)	T (k)	Q (g/s)	M_1
Scrubber	25.6032	38,000	17.93	330.37	0.082	1,852,262
Lactose Baghouse	25.6032	4,800	2.27	322.04	0.001	14,824,055
WPC Baghouse	25.6032	41,000	19.35	347.04	0.002	90,971,154

1 Lowest M is used for combined stack emissions: M = stack height * flow * T/Q (emission rate)

Emissions

The estimated Particulate Matter (PM_{10}) emissions by source are shown in Tables 2 and 3. The emission rates are based on a constant solids output.

TABLE 2
Annual Emission Rates in Tons per Year

Source ID	PM_{10}	IDAPA Exemptions
Lactose Scrubber	22.10	
Lactose Baghouse	0.044	58.01.01.220
WPC Baghouse	0.064	58.01.01.220
Total	22.208	

TABLE 3
Maximum Hourly Emission Rates in Pounds per Hour

Source ID	PM_{10}	IDAPA Exemptions
Lactose Scrubber	5.04	
Lactose Baghouse	0.010	58.01.01.220
WPC Baghouse	0.015	58.01.01.220
Total	5.065	

Regulatory Review

Standards and Criteria Levels

Table 4 summarizes applicable criteria including:

- Significant contribution levels (SCL),
- National Ambient Air Quality Standards (NAAQS).

TABLE 4
Regulatory Standards and Significance Levels

Pollutant	Averaging Period	NAAQS		SCL ($\mu g/m^3$)
		$\mu g/m^3$	ppm	
PM_{10}	Annual	50	--	1
	24-Hour	150	--	5

SCREEN3 modeled concentrations will be compared to the applicable Idaho significant contribution levels (SCL) shown in Table 4. If the predicted impacts are not significant (that is, less than the SCL), the modeling is complete for that pollutant under that averaging time. A preliminary modeling run for PM_{10} resulted in concentrations below the SCL. Therefore, a more refined modeling analysis is not anticipated.

However, if impacts are significant using SCREEN3, a more refined analysis will be conducted for demonstration of compliance with the NAAQS. CH2M HILL will submit an amended protocol to DEQ for approval if refined modeling is required.

Appendix F

EPA Guidance for Estimating "M"

Appendix F
Evaluate Lowest Value for M

Source	Stack Height-hs (m)	Stack Gas Flow (cfm)	Stack Gas Flow (cms)	Temp (Deg K)	Emission Rate-Q (g/s)	M
Lactose Scrubber	25.6	38,000	17.93	330.37	0.083	1,827,662
Lactose Baghouse	25.6	4,800	2.27	322.04	0.013	1,489,692

Note: M = hs*flow*temp/Q
Lowest M is used for combined stack emissions
Modeling emission rate input = 0.096 g/s

2.2 Merged Parameters for Multiple Stacks

Sources that emit the same pollutant from several stacks with similar parameters that are within about 100 meters of each other may be analyzed by treating all of the emissions as coming from a single representative stack. For each stack compute the parameter M:

$$M = (h_s V T_s)/Q \qquad (2.1)$$

where M = merged stack parameter which accounts for the relative influence of stack height, plume rise, and emission rate on concentrations

h_s = stack height (m)

$V = (\pi/4)\, d_s^2\, v_s$ = stack gas volume flow rate (m^3/s)

d_s = inside stack diameter (m)

v_s = stack gas exit velocity (m/s)

T_s = stack gas exit temperature (K)

Q = pollutant emission rate (g/s)

The stack that has the lowest value of M is used as a "representative" stack. Then the sum of the emissions from all stacks is assumed to be emitted from the representative stack; i.e., the equivalent source is characterized by h_{s1}, V_1, T_{s1} and Q, where subscript 1 indicates the representative stack and $Q = Q_1 + Q_2 + \ldots + Q_n$.

The parameters from dissimilar stacks should be merged with caution. For example, if the stacks are located more than about 100 meters apart, or if stack heights, volume flow rates, or stack gas exit temperatures differ by more than about 20 percent, the resulting estimates of concentrations due to the merged stack procedure may be unacceptably high.

Appendix G
Screen3 Summary Table and Output Results

Appendix G
Screen3 Modeling Results

SCREEN3 1-HR Ave. Concentration (ug/m^3)	SCREEN3 Persistent Factors	Adjusted Ave. Period	Estimated Ambient Concentration (ug/m^3)	Significant Contribution (ug/m^3)	Below Significant Contribution
9.69	24-Hour	0.4	3.876	5	Yes
	Annual	0.08	0.7752	1	Yes

Note: Estimated Ambient Conc. = SCREEN3 1-hr ave. conc. x adjusted ave. period

05/03/07
11:42:36

```
 ***  SCREEN3 MODEL RUN  ***
 *** VERSION DATED 96043 ***

Glanbia Foods Inc., Gooding Lactose Productin Increase -Revised Run

SIMPLE TERRAIN INPUTS:
   SOURCE TYPE             =        POINT
   EMISSION RATE (G/S)     =      .960000E-01
   STACK HEIGHT (M)        =      25.6000
   STK INSIDE DIAM (M)     =        .9900
   STK EXIT VELOCITY (M/S)=       2.9429
   STK GAS EXIT TEMP (K)   =     322.0400
   AMBIENT AIR TEMP (K)    =     293.0000
   RECEPTOR HEIGHT (M)     =        .0000
   URBAN/RURAL OPTION      =        RURAL
   BUILDING HEIGHT (M)     =      12.5000
   MIN HORIZ BLDG DIM (M) =       45.7300
   MAX HORIZ BLDG DIM (M) =       45.7300

THE REGULATORY (DEFAULT) MIXING HEIGHT OPTION WAS SELECTED.
THE REGULATORY (DEFAULT) ANEMOMETER HEIGHT OF 10.0 METERS WAS ENTERED.

   STACK EXIT VELOCITY WAS CALCULATED FROM
   VOLUME FLOW RATE =   4800.0000     (ACFM)

BUOY. FLUX =     .638 M**4/S**3;  MOM. FLUX =    1.931 M**4/S**2.

*** FULL METEOROLOGY ***

**********************************
*** SCREEN AUTOMATED DISTANCES ***
**********************************

*** TERRAIN HEIGHT OF    0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***
```

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
10.	.0000	1	1.0	1.1	320.0	39.91	3.77	2.33	NO
100.	8.189	6	4.0	6.7	10000.0	27.92	4.26	13.00	HS
200.	9.197	4	1.5	1.7	480.0	34.45	15.77	17.48	HS
300.	9.157	4	1.5	1.7	480.0	34.45	22.75	20.40	HS
400.	8.578	4	1.5	1.7	480.0	34.45	29.56	23.23	HS
500.	7.803	4	1.5	1.7	480.0	34.45	36.23	25.99	HS
600.	7.007	4	1.5	1.7	480.0	34.45	42.79	28.68	HS
700.	6.263	4	1.5	1.7	480.0	34.45	49.25	31.32	HS
800.	6.270	4	1.0	1.2	320.0	38.88	55.70	27.05	NO
900.	6.120	4	1.0	1.2	320.0	38.88	62.00	29.71	NO
1000.	5.837	4	1.0	1.2	320.0	38.88	68.23	32.32	NO

```
MAXIMUM 1-HR CONCENTRATION AT OR BEYOND     10. M:
   125.    9.693       6     3.5     5.9 10000.0   29.52     5.32    15.10     HS

 DWASH=   MEANS NO CALC MADE (CONC = 0.0)
 DWASH=NO MEANS NO BUILDING DOWNWASH USED
 DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
 DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
 DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

*****************************************
     *** REGULATORY (Default) ***
```

```
   PERFORMING CAVITY CALCULATIONS
  WITH ORIGINAL SCREEN CAVITY MODEL
          (BRODE, 1988)
****************************************

 *** CAVITY CALCULATION - 1 ***        *** CAVITY CALCULATION - 2 ***
  CONC (UG/M**3)      =    .0000        CONC (UG/M**3)      =    .0000
  CRIT WS @10M (M/S) =    99.99        CRIT WS @10M (M/S) =    99.99
  CRIT WS @ HS (M/S) =    99.99        CRIT WS @ HS (M/S) =    99.99
  DILUTION WS (M/S)  =    99.99        DILUTION WS (M/S)  =    99.99
  CAVITY HT (M)      =    12.67        CAVITY HT (M)      =    12.67
  CAVITY LENGTH (M)  =    41.80        CAVITY LENGTH (M)  =    41.80
  ALONGWIND DIM (M)  =    45.73        ALONGWIND DIM (M)  =    45.73

CAVITY CONC NOT CALCULATED FOR CRIT WS > 20.0 M/S.  CONC SET = 0.0

****************************************
      END OF CAVITY CALCULATIONS
****************************************


     ***************************************
     *** SUMMARY OF SCREEN MODEL RESULTS ***
     ***************************************

 CALCULATION           MAX CONC    DIST TO   TERRAIN
  PROCEDURE           (UG/M**3)    MAX (M)    HT (M)
 --------------       -----------  -------   -------
SIMPLE TERRAIN          9.693        125.        0.

***************************************************
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
***************************************************
```